



**8TH INTERNATIONAL FOOD LEGUME  
RESEARCH CONFERENCE AND  
5TH AUSTRALIAN PULSE CONFERENCE**  
15 - 19 SEPTEMBER 2025 • PAN PACIFIC PERTH



**ABSTRACT BOOK**





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# **Theme:**

## **Agronomy and Farming Systems**



## **Genome-Wide Association Analysis of Drought Tolerance in a Chickpea MAGIC Population**

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A Multi-parent Advanced Generation Inter-Cross (MAGIC) population of chickpea, comprising 3,054 MAGIC-derived Recombinant Inbred Lines (RILs), was evaluated under contrasting drought environments in Alem Tena (Ethiopia) and Terbol (Lebanon) to identify genomic regions associated with drought tolerance. Field phenotyping was based on a 1–9 drought tolerance scoring scale, where lower scores indicated better performance. A total of 3,354 experimental field plots were evaluated, including 300 replicated genotypes used as checks to improve scoring accuracy and adjust environmental effects. Data analysis was performed using Multi-Environment Trials (MET) and REML-based variance components models. Genotyping of the MAGIC population was conducted using a 689,802 SNP dataset, later filtered to 495,495 high-quality SNPs using vcftools. The SNPs were distributed across 8 chickpea chromosomes. Population structure analysis was performed using the LEA package in R. The results of GWAS revealed significant genotype-by-environment interactions and identified environment-specific SNPs linked to drought tolerance. Forty-two RILs showed high drought tolerance (score  $\leq 3$ ) in Lebanon, while 40 distinct RILs were tolerant in Ethiopia. Twenty-nine RILs were moderately to highly tolerant across both locations. The contrasting timing of drought stress (post-winter in Lebanon and post-summer in Ethiopia) likely contributed to the distinct genetic associations observed. Moreover, 29 RILs were identified with elevated seed protein content, with 135 SNPs on a 182-kbp region of chromosome 5 significantly associated with this trait. These results provide valuable genomic resources for the development of climate-resilient and nutritionally enhanced chickpea cultivars, with potential applications in Australia and other dryland farming systems.